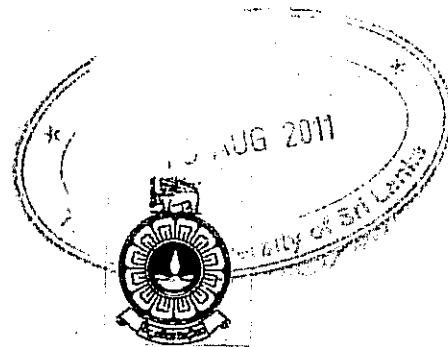


THE OPEN UNIVERSITY OF SRI LANKA
B.Sc. DEGREE PROGRAMME: LEVEL 04
CLOSED BOOK TEST: 2010/2011
CSU2279: DATA STRUCTURES AND ALGORITHMS



DURATION: ONE AND HALF HOURS (1 ½ HOURS)

Date: 29th April, 2011

Time: 4.00 pm – 5.30 pm

Answer ALL Questions.

Q1.

- a) Create a binary tree using the following values.

120, 60, 165, 78, 44, 180, 172, 56, 71, 47, 130, 37, 15, 135

- What is the *depth* of this tree?
- What is the *level* of 56?
- What is the *degree* of 180?
- What are the *leaf nodes* of your tree diagram?
- Give all the *ancestors* of 37.
- Give all the *descendants* of 78.
- Is the above binary tree a strictly binary tree? Justify your answer.
- Does 130 has a *sibling*? If it has, give the value of it.
- What will be the result if the root of the above tree is removed? Clearly draw the resultant diagram.

- b) Give the outputs of Preorder, Inorder and Postorder traversals of the above tree.

- c) Represent the following algebraic equation as a binary tree.

$((a - b) + (c * (d + e))) \$ ((f / g) * h)$

- d) Write a procedure to insert a right child X, to a tree structure.

- e) Write a procedure for postorder traversal.

Q2.

- State the differences between internal sorting methods and external sorting methods.
- What are the advantages of advanced internal sorting algorithms than simple internal sorting algorithms? Give an example for advanced sorting algorithms.
- Name three simple internal sorting algorithms and give one example for each of them.

- d) Write a sorting algorithm which sort by exchange.
- e) The scores of five Indian batsmen in the ICC world cup 2011 final are given below.

Name	Runs
Virender Sehwag	0
Sachin Ramesh Tendulkar	18
Gautam Gambhir	97
Virat Kohli	35
Mahendra Singh Dhoni	91

- Sort the players in alphabetic order by using their last name. Use the sorting algorithm given as the answer for part (d) for this purpose. (Write all steps clearly)
- Sort the players by using their runs in ascending order. Use linear insertion sorting algorithm.

Q3.

- Searching methods can be classified according to different criteria. Name them.
- What are the three kinds of variations of sequential searching methods?
- What are the factors that the running time of an algorithm depends on?
 - Perform a Big- O analysis for the following function.

$$\frac{10(n-1)(n+1)}{5(n-1)}$$

- What are the two notations used to discuss growth rate. Differentiate among these two notations.
- d) Consider the following function.

```

Function fact (i: integer): integer;
Begin
    fact: = 0;
    if I <=0 then
        fact: = 1
    else
        fact: = I * fact (i - 1);
End;
```

- What are the differences between 'Recursive' and 'Non recursive' algorithms?
- Write a non recursive algorithm for the function given above.

- iii. Calculate the running times of the *recursive* and *non recursive* algorithms.
- e)
 - i. What is a set?
 - ii. What are the two representations of sets?
- f) $S1 = \{1, 3, 5, 6, 8\}$
 $S2 = \{0, 1, 2, 3, 4, 5, 9\}$

Using the above given two sets find the following by using appropriate diagrams.

- i. Set union
- ii. Set difference ($S1 - S2$)
- iii. Set intersection

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